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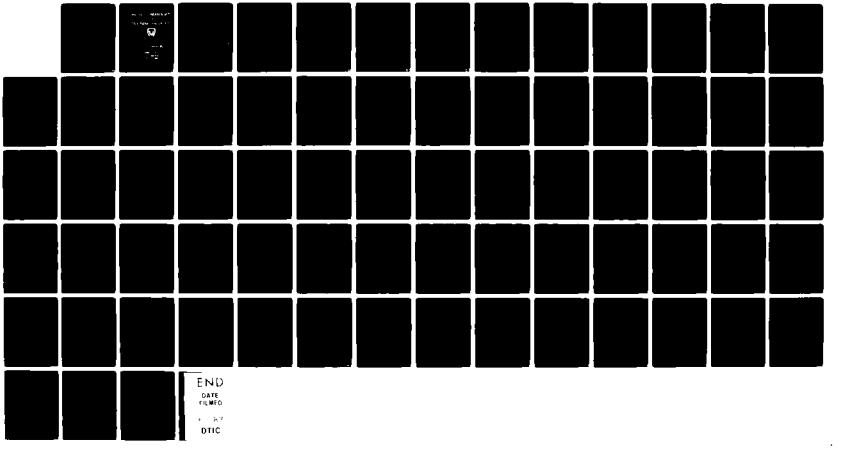

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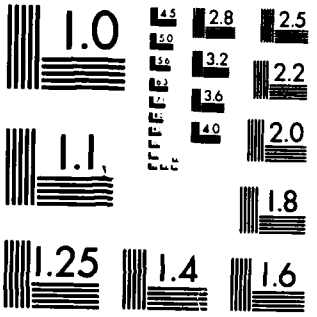

PROJECT MANAGER
FOR
TRAINING DEVICES

USER'S MANUAL
FOR
TRAINING DEVICE COST MODEL (TRACOM)

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

TRACOM is a computerized cost model designed to aid the analyst in preparation of Baseline Cost Estimates (BCE). The User's Manual instructs the user how to use the model. The manual describes what data is required, how to input the data, and how to use the model routines to develop a BCE.

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USER'S MANUAL

FOR

TRAINING DEVICE

COST MODEL

" T R A C O M "

PREPARED FOR: PROJECT MANAGER FOR TRAINING DEVICES

PREPARED BY: SCIENCE APPLICATIONS INCORPORATED

DATE 3/25/83

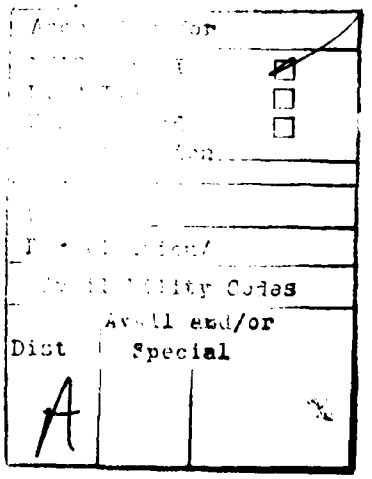

TABLE OF CONTENTS

SECTION I INTRODUCTION

The purpose of this User's Manual is to help an experienced cost analyst understand and use TRACOM.

TRACOM is:

A software model which automates the life cycle cost estimating process for training device programs that operates on an HP 3000 computer using HP BASIC (C),1979.

TRACOM is designed to:

Help the experienced cost analyst prepare Baseline Cost Estimate (BCE) tables in a form that may be incorporated in a final BCE report.

TRACOM provides:

A structured approach for preparing BCE tables specifically for PM TRADE programs.

TRACOM allows the cost analyst to manipulate costs associated with each element of the Work Breakdown Structure (WBS) or the associated cost elements prescribed by the 11-series Department of Army Pamplets (DAPam) in a number of ways:

Data may be calculated elsewhere and throughput into TRACOM; and/or

Cost Estimating Relationships and CUM/UNIT LEARNING CURVES (each with unique data input requirements as explained in Section II) may be utilized that input the costs automatically; and/or

If a DAPam format is utilized, WBS costs can be transferred to the DAPam formats without having to re-input the data; and/or

Escalation factors can be used to inflate the costs from constant dollars to current (then-year) dollars.

In addition to the above introductory explanations, TRACOM will currently accept project descriptors (i.e title,time period, appropriations, etc.), Cost Estimating Relationships (CERs) and throughput data. The throughput data may be loaded as a single cost entry or as a time phased series. A wide variety of output reports have been developed for TRACOM. The user will rarely require the complete set. The intent is to provide a large variety of tables and allow the user to select those tables most suitable for a particular project. A set of user tables may be prepared in addition to the regular BCE tables. The purpose of the user tables is to assist the cost analyst during modeling operations and to provide back up data.

This User's Manual shows the experienced cost analyst how to operate TRACOM by describing the basic steps that enable the user to:

Log on to the computer
Set up project data

Input data

Operations are described from a user's point of view.

Information that an applications programmer would require is incorporated as comment statements in the TRACOM software. User's who wish to apply TRACOM to non-Army training device programs should conduct a thorough analysis of TRACOM capabilities before attempting to apply TRACOM.

A quick reference of how to use the TRACOM model can be found in Appendix D.

SECTION II HOW THE MODEL WORKS

Section I pointed out that TRACOM is designed to aid the cost analyst in preparing BCE tables. The primary benefit TRACOM provides to the user is the capacity to make changes to the cost data rapidly and easily once TRACOM has been set up.

Section II is a broad overview of the preliminary actions required to set up TRACOM and make it operational. Detailed procedural instructions are located in Appendix A.

The first step in setting up TRACOM is establishing a Chart of Accounts (COA). Once the COA has been established, the cost analyst has two choices to select from regarding the manner in which the BCE tables can be presented:

CHOICE #1. The BCE tables can be presented in the WBS format. A benefit in selecting CHOICE #1 is that data can be transfered from WBS format to DAPam format, but not vice versa. (WBS costs have only to be entered once).

CHOICE #2. The BCE tables can be presented in DAPam format.

In addition to the choices available regarding the manner in which the BCE tables can be presented, the cost analyst has three choices to select from regarding the manner in which the cost data can be INPUT:

CHOICE A. The cost data can be THROUGHPUT.

CHOICE B. The cost data can be CALCULATED using any combination of the CER, LEARNING CURVE, or S-CURVE/BETA DISTRIBUTION.

CHOICE C. The cost data can be ESCALATED to reflect different escalation and spending rates.

Before the cost analyst can select the manner in which the BCE tables will be presented (i.e. CHOICE #1 or CHOICE #2) or select the manner in which data can be input (i.e. CHOICE A, B, or C) the cost analyst MUST create a Chart of Accounts file and six other files. These seven files must be created and saved in the EDITOR mode. A brief discussion of these seven files and their respective purposes follows immediately below. A detailed discussion of the seven files, their formats and instructions for their creation is located in Appendix A.

It is STRONGLY RECOMMENDED the the user review Appendix A before proceeding further.

FILE NAME	FILE PURPOSE
GLOBERAW	Tells the computer which of the various print routines are to be used for headings and beginning-and-ending years.
COARAW	Tells the computer: Which elements are to be presented in either the WBS or DAPam formats; and Transfer WBS costs to DAPam elements; and

Assign which appropriations the different DAPam elements are to receive; and

Prompt the user for data input into the input routines.

SCHEDULE Tells the computer which schedules are to be used in TRACOM.

LEADLAG Tells the computer how WBS costs are to be spread by time to the DAPam elements that were specified in COARAW.

CER Tells the computer to exercise CERs used by TRACOM and to place the resultant costs in specific WBS or DAPam elements.

TMFZRAW Tells the computer how the analyst wants costs spread to the DAPam format using S-CURVE/BETA DISTRIBUTIONS. TMFZRAW stands for Time Phased Raw data.

LERNCURV Tells the computer what type of learning curve (cumulative or unit) is to be applied and which slope the analyst wants to use in calculating WBS costs.

IMPORTANT

All of the above files must be created in accordance with the instructions in Appendix A, even if they are not used. The files which are not used may contain no data but they must be created and present for TRACOM to run. The most rudimentary version of TRACOM will operate with the data contained in GLOBERAW AND COARAW; the other files direct the processes in the more advanced utilization of TRACOM. Each file is described in detail in Appendix A. Additional files are created by TRACOM. Their names and uses are described in the program listings.

After the seven files have been created and saved, the analyst should log on to the computer using the appropriate log-on procedure. For the HP it is as follows;

HELLO Username/Password.Accountname

TRACOM starts automatically once this has been accomplished. Five messages that say 'END OF PROGRAM' should appear on the display. These messages indicate that TRACOM initialization has proceeded correctly. After these messages have appeared, the following message will be displayed on the screen:

```
**************************************************************************

************************WELCOME TO THE TRACOM COST MODEL**************

THESE ARE THE VARIOUS OPTIONS AVAILABLE TO YOU:
1  You can input your WBS data
2  You can input your DaPam data
```

3 You can input your Schedule data
4 You can input your escalation factors
5 You can make printouts of the added up WBS and/or DaPam data

Please enter your option number (1-5) and press the 'RETURN' key and the user will receive further instructions.

****

Options 1, 2, and 3 listed above allow the user to perform the following data input procedure:

- Throughput the WBS, DAPam, or SCHEDULE data.

Option 4 listed above allows the user to perform the following data input procedure:

- Input or change the escalation factors.

Option 5 listed above allows the user to perform the following data input procedures:

- Exercise the LEARNING CURVE, S-CURVE/BETA DISTRIBUTION, or CER routines , add up the WBS and DAPam costs and get a printout of the inputs and resultant outputs.

When the last printout is completed, TRACOM will automatically log the user off the computer. Therefore, to do anything else with the data requires the user to log onto the computer again.

The data input options listed above and their respective data entry procedures are described in Section III.

A DATA flow chart of the TRACOM model is presented in Appendix D.

SECTION III DESCRIPTION OF THE DATA ENTRY PROCEDURES

Section III describes and defines the available data entry procedures of TRACOM. The descriptions of the available data entry procedures are listed in the order that they appear in the WELCOME TO THE TRACOM menu, as shown in Section II. The analyst will have to decide prior to using TRACOM which data entry procedures will aid him the most in preparing the BCE. If any of the advanced data entry procedures (i.e. LEADLAG, CER, S-CURVE, or LEARNING CURVE) are employed, schedule data must be input first using Option 3 from the above menu, then the WBS and DAPam formatted data using Options 1 and 2.

There are three routines in which data can be entered into the WBS format; the WBS INPUT ROUTINE, LEARNING CURVE and CER CALCULATION ROUTINES.

Data can be input via the WBS INPUT ROUTINE.

The WBS INPUT ROUTINE must be used to set up the WBS file structure. The user wil be prompted for every WBS item in the COARAW file that does not have a 'T' in column 75. A zero value is entered for those items that will be calculated using the CER or the LEARNING CURVE ROUTINES. See Appendix C for WBS input forms.

Data can be input via the LEARNING CURVE CALCULATION ROUTINE.

The LEARNING CURVE ROUTINE must be used if it is required that the computer calculate costs for WBS items based on a LEARNING CURVE. The LERNCURV file is set up using the directions in Appendix A. When the schedule data is entered in the SCHEDULE INPUT ROUTINE, the computer will calculate the costs and store the results in the proper WBS items. The LEARNING CURVE CALCULATION ROUTINE may be used in conjunction with either of the other two options. However, the user must have set up the WBS file structure via the WBS INPUT ROUTINE prior to using the LEARNING CURVES CALCULATION ROUTINE.

Data can be input via CER CALCULATION ROUTINE.

The CER CALCULATION ROUTINE must be used if the user wants the computer to calculate WBS costs using CERs. To proceed, the CERs are set up in accordance with the directions in Appendix A. Entries or changes to the values of the variables used in the CERs are made after the user has exercised OPTION 5 in the WELCOME TO THE TRACOM MODEL screen display. The CER ROUTINE may be used in conjunction with either of the two previous options. However, the user must have set up the file structure via the WBS INPUT ROUTINE prior to using CERs.

There are four routines in which data can be input into the DAPam format; the DAPam INPUT ROUTINE, S-CURVE/BETA DISTRIBUTION, LEADLAG, and CER CALCULATION ROUTINES.

Data can be input via the DAPam INPUT ROUTINE.

The DAPam INPUT ROUTINE must be used to set up the DAPam

file structure--the user will be prompted for every DAPam item in the COARAW file that does not have a 'T' in column 75. A zero value is entered for those items that will be calculated using the CER and S-CURVE/ BETA DISTRIBUTION CALCULATION ROUTINES.
See Appendix C for DAPam input forms.

Data can be input via the S-CURVE/BETA DISTRIBUTION CALCULATION ROUTINE.

The S-CURVE ROUTINE must be used if it is required that the computer calculate costs for DAPam items based on BETA DISTRIBUTIONS. The TMFZRAW file is set up in accordance with the directions in Appendix A. When schedule data is input via the SCHEDULE INPUT ROUTINE, the computer will calculate the costs and store the results in the proper DAPam element.
This option may be used in conjunction with either of the other three options. However the user must have set up the file structure via the DAPam INPUT ROUTINE prior to using S-CURVES.

Data can be input via CER CALCULATION ROUTINE.

The CER ROUTINE must be used if it is necessary for the computer to calculate DAPam costs using the CERs.
The CERs are set up in accordance with the directions in Appendix A. Entries or changes to the values of the variables used in the CERs are made after the user has exercis OPTION 5 in the WELCOME TO THE TRACOM MODEL screen display.
The CER CALCULATION ROUTINE may be used in conjuntion with either of the other three options. However, the user must have set up the file structure via the DAPam INPUT ROUTINE prior to using CERs.

Data can be input via the LEADLAG CALCULATION ROUTINE.

The LEADLAG ROUTINE must be used if it is required that WBS costs be transfered to the DAPam format. The user must note th the WBS cost is to be transfered by indicating the appropriate DAPam Row Number in the XREF field of the COARAW record for the WBS item. You must have set up a LEADLAG file per the directions in Appendix A and the user must have input schedule data via the SCHEDULE INPUT ROUTINE.
This option may be used in conjunction with either of the other three options. However, the user must have set up the file structure via the DAPam INPUT ROUTINE prior to using the LEADLAG CALCULATION ROUTINE.

There is only one way data can be input into the SCHEDULE. It is through the SCHEDULE INPUT ROUTINE.

The SCHEDULE INPUT ROUTINE must be used to set up the SCHEDUL file structure--the user will be prompted for every SCHEDULE item in the SCHEDULE file that does not have

a 'T' in column 75. A zero value is entered for those items that do not contain information.
See Appendix C for Schedule input forms.

The information presented above detailed WHAT ROUTINES may be used to input data into TRACOM. The following paragraphs detail HOW the data can be input into TRACOM using methods of interactive data input.

METHODS OF INTERACTIVE DATA INPUT

WBS INPUT ROUTINE

In order to throughput WBS costs/hours data, the user must have entered a Chart of Accounts in the EDITOR mode and saved the data in a file called COARAW (see file specifications in APPENDIX A). When the menu titled "WELCOME TO THE TRACOM COST MODEL" appears, the user should enter "1" (You can input your WBS data) and press the "RETURN" key. The following menu will then appear.

****

WBS INPUT ROUTINE

THESE ARE YOUR OPTIONS
1 CREATE
2 ADD
3 MODIFY
4 CHANGE WBS SPECIFICATIONS
5 EXIT AND LIST
ENTER YOUR SELECTION:

****

OPTION 1 CREATE

This option sets up the file structure of the WBS work file. It prompts the user for the number of functional elements desired and their names (a maximum of five characters are allowed). These functional elements may be any breakdown of cost or hours that would be used by the analyst to calculate the value of the WBS elements. If the functional element is to contain dollar values, the element name must contain the $ sign (e.g. MATL$). If the functional element contains a non-dollar value such as hours, then omit the $ sign (e.g. ENGHR). The $ sign informs the computer which elements are cost elements and are to be totaled across during the totaling process. The user is then prompted to input the cost/hours data for each element that the user has indicated is not a "TOTAL" element in his chart of accounts. This process continues until all of the data has been input or the user directs the computer that data entry is to terminate by entering "99999". In either case, entering data or terminating, the computer returns the user to the WBS INPUT ROUTINE menu. The user can then select another option.

OPTION 2 ADD

This option allows the user to resume data input after deciding to terminate data entry by entering "99999". Data entry will resume with the FIRST column in the element of the WBS item that data entry stopped on previously. Again, the user will be prompted to input data for each element that is not a "TOTAL" until all data has been entered or the user desires to terminate by entering "99999".

OPTION 3 MODIFY

This option allows the user to make changes to the data that has already been entered. The user will be prompted to enter the row number and column number of the item to be changed. The cursor will move under the element indicated and the new value can be entered. Remember to press the "RETURN" key. Continue this operation until all elements of this WBS item are correct, then enter zero "0" to be prompted for another WBS item row number. If no other changes are to be made then enter zero "0" and the "WBS INPUT ROUTINE" menu will again be displayed.

OPTION 4 CHANGE WBS SPECIFICATIONS

This option permits the user to make additions/deletions and changes to the Chart of Accounts in the WBS work file. First, the COARAW file must have been changed and saved. The user will be asked whether COARAW was changed, answer "YES" or "NO". If the answer is "YES" then changes will be made; if the answer is "NO" then no changes will be made. NOTE: The specifications will be automatically changed if the user chose OPTION 3 whether you have made changes in COARAW or not.

OPTION 5 LIST AND EXIT

This option lists out all of the inputs made thus far, and returns the user to the "WELCOME TO THE TRACOM COST MODEL" menu.

DAPam INPUT ROUTINE

In order to throughput DAPam cost data, the user must have entered a chart of accounts in the EDITOR mode and saved the data in a file called COARAW (see file specifications in APPENDIX A). When the menu titled "WELCOME TO THE TRACOM COST MODEL" appears, enter "2" and press the "RETURN" key. The following menu will appear.

****

DAPam INPUT ROUTINE

THESE ARE YOUR OPTIONS

1 CREATE
2 ADD
3 MODIFY

```
   4   CHANGE DAPam SPECIFICATIONS
   5   EXIT AND LIST
ENTER YOUR SELECTION:
```

****

OPTION 1 CREATE

This option sets up the file structure of the DAPam work file. It prompts the user for the beginning and ending year of the program. Usually, but not necessarily these are the beginning of the R&D phase and the end of the O&S phase. The user will then be prompted for the years which data is to be input for a specific DAPam item, then prompted to input the cost data for each year indicated. This will continue until the user has input all of the data or has indicated to the computer that he wishes to terminate data entry by entering "99999". The DAPam INPUT ROUTINE menu will appear and another option can be selected.

OPTION 2 ADD

This option allows the user to resume data input if the user elected to terminate data entry by entering "99999". Data entry will resume with the FIRST year of the last input DAPam item. Prompts to input data for each item that is not a "TOTAL" will continue until all data has been entered or the user desires to terminate by entering "99999".

OPTION 3 MODIFY

This option permits changes to the data that have already been entered. The user will be prompted to enter the row number of the item to be changed and then prompted again for the year to be changed. The cursor will move under the year indicated, enter the new value and press the "RETURN" key. Continue this operation until all years of this DAPam item are correct, then enter zero "0" to be prompted for another DAPam item row number. If no other changes are to be made then enter zero "0" and the "DAPam INPUT ROUTINE" menu will be displayed and another option can be selected.

OPTION 4 CHANGE DAPam SPECIFICATIONS

This option permits the user to make additions/deletions and changes to the chart of accounts in the DAPam work file. First, the COARAW file must have been changed and saved. The user will be asked whether COARAW was changed, answer "YES" or "NO". If the answer is "YES" then changes will be made; if the answer is "NO" then no changes will be made. NOTE: The specifications will be automatically changed if the user chose OPTION 3 whether or not you have made changes in COARAW.

OPTION 5 LIST AND EXIT

This option lists out all of the inputs made thus far and returns the user to the "WELCOME TO THE TRACOM COST MODEL" menu.

SCHEDULE DATA INPUT ROUTINE

In order to throughput SCHEDULE cost data, the user must have entered a chart of accounts in the EDITOR mode and saved the data in a file called SCHEDULE (see file specifications in APPENDIX A). When the menu titled "WELCOME TO THE TRACOM COST MODEL" appears, enter "3" (You can input your DAPam data) and press the "RETURN" key. The following menu will appear:

```
**********************************************************************

                        SCHEDULE INPUT ROUTINE

THESE ARE YOUR OPTIONS
   1   CREATE
   2   ADD
   3   MODIFY
   4   CHANGE SCHEDULE SPECIFICATIONS
   5   EXIT AND LIST
ENTER YOUR SELECTION:

**********************************************************************
```

OPTION 1 CREATE

This option sets up the file structure of the SCHEDULE work file. It prompts the user for the beginning and ending year of the program. Usually ,but not necessarily these are the beginning of the R&D phase and the end of the O&S phase. The user will then be prompted for the years which data is to be input for a specific SCHEDULE item, then prompted to input the cost data for each year indicated. This will continue until the user has input all of the data or has indicated to the computer that he wishes to terminate data entry by entering "99999". The SCHEDULE INPUT ROUTINE menu will appear and another option can be selected.

OPTION 2 ADD

This option allows the user to resume data input if the user elected to terminate data entry by entering "99999". Data entry will resume with the FIRST year of the last input schedule item. Prompts to input data for each item that is not a "TOTAL" will continue until all data has been entered or the user desires to terminate by entering "99999"

OPTION 3 MODIFY

This option permits changes to the data that have already been

entered. The user will be prompted to enter the row number of the item to be changed and then prompted again for the year to be changed. The cursor will move under the year indicated, enter the new value and press the "RETURN" key. Continue this operation until all years of this schedule item are correct, then enter zero "0" to be prompted for another schedule item row number. If no other changes are to be made then enter zero "0" and the "SCHEDULE INPUT ROUTINE" menu will be displayed and another option can be selected.

OPTION 4 CHANGE SCHEDULE SPECIFICATIONS

This option permits the user to make additions/deletions and changes to the Chart of Accounts in the schedule work file. First, the SCHEDULE file must have been changed and saved. The user will be asked whether SCHEDULE was changed, answer "Y" or "N". If the answer is "Y" then changes will be made; if the answer is "N" then no changes will be made. NOTE: The specifications will be automatically changed if the user chose OPTION 3 whether you have made changes in SCHEDULE or not.

OPTION 5 LIST AND EXIT

This option lists out all of the inputs made thus far and returns the user to the "WELCOME TO THE TRACOM COST MODEL" menu.

INPUT ESCALATION FACTORS

NOTE: The user must at least exercise Option 5 of the following menu if escalated costs are desired.

If it is desirable to change the escalation factors because of a unique application, this routine allows the user to do that. When the menu titled "WELCOME TO THE TRACOM COST MODEL" appears, enter "4" (You can input your escalation factors) and press the "RETURN" key. The following menu will appear:

****

THESE ARE YOUR OPTIONS
1 = CREATE/ADD
2 = MODIFY
3 = LIST
4 = EXIT
5 = CREATE USING INTERNAL TABLE

```
SELECT ONE OF THE FOLLOWING APPROPRIATION FUNDS AND INPUT THE CORRESPONDING
 CODE:
 RDT = (RDT&E) RESEARCH,DEVELOPMENT,TESTING,EVALUATION
 MCA = MILITARY CONSTRUCTION
 MPA = MILITARY PERSONNEL
 OMA = OPERATIONS AND MAINTENANCE
 OPA = OTHER PROCUREMENT
 AMA = AMMUNITION PROCUREMENT
 APA = AIRCRAFT PROCUREMENT
 MAA = MISSILES PROCUREMENT
 WVA = WEAPONS/TRACK COMBAT VEHICLES
 RDIH = RDT&E IN-HOUSE
 OMS = OPERATIONS AND MAINTENANCE, SALARY
 PEM = PRODUCTION
 E  = EXIT
*****************************************************************

 REQUIRED APPROPRIATION FUND CODE IS:
```

OPTION 1 CREATE/ADD

This option allows the user to clear out the entire escalation file and input a complete set of escalation factors for each appropriation.

OPTION 2 MODIFY

This option permits change of escalation factors in selected appropriations.

OPTION 3 LIST

This option lists the escalation factors for selected appropriations.

OPTION 4 EXIT

This option lists out all of the appropriation escalation factors and returns the user to the "WELCOME TO THE TRACOM COST MODEL" menu.

OPTION 5 CREATE USING THE INTERNAL TABLE

This option will restore the escalation factors to those that are generally used. NOTE: As new factors are received, the Data Processing Personnel will automatically update the factors using information found in the code listing of the NEWFACT program.

MAKE PRINTOUTS OF THE ADDED UP WBS AND/OR DAPam DATA

In order for the user to make printouts of the added up WBS and/or DAPam formatted data and to utilize the CER, S-CURVE, LEARNING CURVE, and LEADLAG routines. When the "WELCOME TO THE TRACOM COST MODEL" menu appears, enter "5" and and press the "RETURN" key.

This option automatically starts the addition routines. The first routine encountered is the ADDWBS routine, which calls the LEARNING CURVE AND CER routines. If data has been saved in the LERNCURV file, it is used as input into the LEARNING CURVE routine (See APPENDIX A for proper formats and an explanation of the purpose of the routine). If data has been saved in the CER file then it is used as input into the CER routine (See APPENDIX A for proper formats and an explanation of the purpose of the routine). If no data has been saved in either or both of these files, then no calculations are performed by these routines and only the data that was input in the WBS INPUT ROUTINE will be added up.

After the WBS formatted costs have been calculated and added, the DAPam formatted costs are calculated and added. If data has been saved in the LEADLAG file, LEADLAG calculations are performed. If data has been saved in the TMFZRAW file, S-CURVE/BETA DISTRIBUTION calculations are performed. If data has been saved in the CER file, CER calculations are performed. See Appendix A for an explanation of the purpose of these files. After the DAPam formatted costs have been added up, the terminal screen displays the different types of printouts that can be obtained.

APPLICATION OF THE LEARNING CURVE, CER, LEAD LAG AND S-CURVE/ BETA DISTRIBUTION ROUTINES.

The following paragraphs briefly describe the uses of the previously mentioned routines.

LEARNING CURVE ROUTINE

The LEARNING CURVE Routine computes the learning curve values to be put in the selected WBS rows using the records found in the LERNCURV file. The records contain the following information:

OUTPUT ROW NUMBER	The WBS number where the derived cost is to go.
SCHEDULE ROW NUM.	The row number of the schedule where quantities to be used in the calculations are found.
FIRST UNIT COST	The cost of the first unit in dollars.
SLOPE	The learning curve percentage expressed in two digits.
CURVE TYPE	Use "WL" for Wright curves (CUM average theory)

or "CL" for Crawford curves (UNIT theory).

CER ROUTINES

The CER routines allow the user to set up a cost model which will perform calculations using the working files created by other routines in this program and the CER work file created by this program.

The user creates a file in EDITOR containing the CER redords. The records are processed in the order they appear in the CER file. Therefore, CER results that are dependent upon the results of other CERs should appear after those CERs The current limit on the CER file is a maximum of 750 records. The program reads through the CER file and performs an edit check of all the records to make sure that they conform to one of the allowed formats described below. During the edit check, row numbers and constants are checked for validity. If any errors are found, the program prints a list of the records where errors are found and then terminates. If no errors are found the program reads the file and performs the requested operation, as each record is read, the OUTPUT ROW NUMBER is compared to the previously read record. If found to be different, the element previously being calculated is written to the appropriate work file. Otherwise the same data element is maintained in memory and the next process is applied to it. After the last CER record is processed, the program ends and a listing of the variables and CERs processed is printed.

When the CER program is running, the user will be prompted as to whether or not it is desirable to change variables. Respond "Y" or "N". If the user decides to change variables, an options menu is displayed.

OPTION A allows the user to add new variables. The user is shown the next consecutive variable number that has not previously been used and is prompted for its value. The first time this program is run, the user starts with variable 0001, then 0002 and so on. To terminate this process enter 9999 as the value of the variable.

OPTION B allows the user to modify existing variables. First the user enters the variable number (e.g. V1234), then enters it's new value. The variable number must already exist (having been created in the add routine above) or an error message will be printed. To terminate the modify routine, enter zero "0" at the "ENTER VARIABLE" prompt.

OPTION C exits the variable manipulation routine and saves all

of the changes, then continues with the main program.

Any CER record must match one of the types below. In the table below D,V,S, and W stand for DAPam, VARIABLE, SCHEDULE and WBS respectively. The valid formats for these entries are a D,W or S and an eight digit row number or a V followed by a four digit variable number. Variable numbers must be left justified in their fields. The C stands for a column number. The P stands for process identifier.

The following table presents the valid CER record types. See Appendix A for a more complete explanation of the CER records.

VALID CER RECORD TYPES

OR	OC	IR	IC	SR	PI	VAR	MEANING
DorV		DorV			P	VorN	OR=IR(P)VAR
DorV					P	VorN	OR=OR(P)VAR
DorV		W,DorV(C)		S			OR=IR(C)XS
DorV		W,DorV(C)		S	P	VorN	OR=[IR(C)(P)VAR]XS
W,DorV	(C)	W,DorV(C)			P	VorN	OR(C)=IR(C)(P)VAR
W,DorV	(C)				P	VorN	OR(C)=OR(C)(P)VAR

NOTES:

OR = OUTPUT ROW NUMBER
OC = OUTPUT COLUMN
IR = INPUT ROW NUMBER
IC = INPUT COLUMN
SR = SCHEDULE ROW NUMBER
N = VALUE
PI = PROCESS IDENTIFIER (+,-,X,/ AND * which stand for addition,subtraction,multiplication division and exponentiation respectivly).
VAR= VARIABLE

D = DAPam
W = WBS
S = SCHEDULE
V = VARIABLE NUMBER
P = PROCESS
C = COLUMN NUMBER

NOTE: The user will be asked twice if he desires to change variable values, once for WBS CERs and once for DAPam CERs. The variables used in both routines are the same, however the user has the option of changing the values, if it is desirable to do so after the WBS CERs have been exercised.
All of the variables may also be entered or changed in the WBS routine.

LEAD LAG ROUTINE

The LEAD LAG ROUTINE transfers costs from the WBS file to the DAPam file. Each WBS entry that has a DAPam Row Number in the XREF column in the chart of accounts is spread to the DAPam entry specified, wherever it has a corresponding record in the LEAD LAG file. The program reads the WBS entry and checks to see if there is an entry in the XREF column. If there is, then the LEADLAG file is read and searched for a record that matches the WBS Row Number. If the Row Number is found, the SCHEDULE file is

searched for the Schedule Row Number. If that is found, then the amount to be spread to the DAPam entry is computed, based upon the schedule and the effect of the lead or lag years and the various percentages specified in the LEAD LAG record. For example, if schedule #1 has a unit entered in the year 1985 and the lead lag record specifies a two year lag and a spend rate of 10%,20%,30% and 40%, then the WBS costs are spread in the following fashion:

BASE YEAR FROM SCHEDULE #1=1985.
SPREAD YEARS BEGIN IN 1985 + 2 LAG YEARS = 1987.
THEREFORE: 10 % OF THE COST GOES IN 1987, 20% IN 1988,
30 % IN 1989 AND 40 % IN 1990.

If lead years had been specified, then the spread years would begin in 1983.

If a LEAD LAG record or a SCHEDULE ROW NUMBER is not found, an appropriate error message will be printed.

Each record in the LEADLAG file contains the following information:

INPUT ROW NUMBER	A WBS ROW NUMBER that corresponds to a WBS row that has a DAPam Row Number in the XREF column in the chart of accounts.
SCHEDULE ROW NUMBER	The Schedule Row Number that contains the units used in the spreading routine.
NUMBER OF LEAD YEARS	A two digit number specifying how many years are to be subtracted from the years in which units appear in the schedule.
NUMBER OF LAG YEARS	A two digit number specifying how many years are to be added to the years in which units appear in the schedule.
1st YEAR PERCENTAGE	A five digit number expressing the percentage of cost to be spread to this particular year (e.g. 00020 or 55.55).
2nd YEAR PERCENTAGE	A five digit number expressing the percentage of cost to be spread to this particular year (e.g. 00020 or 55.55).
3rd YEAR PERCENTAGE	A five digit number expressing the percentage of cost to be spread to this particular year (e.g. 00020 or 55.55).

4th YEAR PERCENTAGE	A five digit number expressing the percentage of cost to be spread to this particular year (e.g. 00020 or 55.55).
5th YEAR PERCENTAGE	A five digit number expressing the percentage of cost to be spread to this particular year (e.g. 00020 or 55.55).
6th YEAR PERCENTAGE	A five digit number expressing the percentage of cost to be spread to this particular year (e.g. 00020 or 55.55).

S-CURVE ROUTINE

The S-CURVE/BETA DISTRIBUTION routine spreads costs using a BETA distributio technique. Each record consists of the following information:

OUTPUT ROW NUMBER	The DAPam row number where the costs are to be spread.
YEAR TO BEGIN SPREADING	The first year costs are to appear in the DAPam element.
NUMBER OF YEARS TO BE SPREAD	The number of years following the first year that costs are to appear.
BETA CURVE NUMBER	Numbers 1 through 5 where: 1= 80% cost spent at 50% time 2= 60% cost spent at 50% time 3= 50% cost spent at 50% time 4= 40% cost spent at 50% time 5= 20% cost spent at 50% time
DOLLAR AMOUNT TO BE SPREAD	This is either a $ amount or WBS row number.

PRINTOUTS

OPTIONS 1 & 2 APPROPRIATIONS (PM)

These printouts show the costs associated to each Project Manager by phase and appropriation. (NOTE: To get these printouts to work the user must use a DAPam numbering scheme that is different than the one that appears in the generic chart of accounts. This scheme apprears in APPENDIX A)

THESE ARE THE TYPES OF PRINTOUTS YOU CAN OBTAIN

APPROPRIATIONS

1 UNESCALATED DOLLARS [PM]	2 ESCALATED DOLLARS [PM]
1.1 UNESCALATED DOLLARS[PHASE]	2.1 ESCALATED DOLLARS[PHASE]

TIME PHASED DOLLARS

3 R&D UNESCALATED	4 R&D ESCALATED
5 INVESTMENT UNESCALATED	6 INVESTMENT ESCALATED
7 O&S UNESCALATED	8 O&S ESCALATED

CONTRACTOR/IN-HOUSE DOLLARS

9 UNESCALATED DOLLARS	10 ESCALATED DOLLARS

MISCELLANEOUS PRINTOUTS

11 WBS DOLLARS	12 SYSTEM LISTING	13 PERCENTAGES
14 COA PRINTOUT		15 DAPam AND APPRO XREF PRINTOUT

BLANK ENTRY FORMS

16 WBS	17 DAPam	18 SCHEDULE

ENTER YOUR OPTION NUMBERS--ENTER '0' TO END

OPTIONS 1.1 & 2.1 APPROPRIATIONS (PHASE)

These printouts show the costs associated to each phase by appropriations.

OPTIONS 3 & 4 R&D DOLLARS

These printouts show the R&D costs spread over time.

OPTIONS 5 & 6 INVESTMENT DOLLARS

These printouts show the INVESTMENT costs spread over time.

OPTIONS 7 & 8 O&S DOLLARS

These printouts show the O&S costs spread over time.

OPTIONS 9 & 10 CONTRACTOR/IN-HOUSE DOLLARS

These printouts show the split between contractor and in-house costs in each DAPam element; these printouts are not spread by time.

OPTION 11 WBS DOLLARS

This printout shows the WBS cost in each element.

OPTION 12 SYSTEM LISTING

This printout shows the GLOBAL data and the escalation factors used to escalate each appropriation in the DAPam.

OPTION 13 PERCENTAGES

This printout shows what percentage each DAPam element is to the total cost and to appropriate phase totals.

OPTION 14 COA PRINTOUT
This printout lists the DAPam and WBS chart of accounts.

OPTION 15 DAPam AND APPRO XREF PRINTOUT
This printout shows which WBS cost elements were transferred to which DAPam elements.

OPTIONS 16-18 ENTRY FORMS
These printouts show the correct formats to use when entering data in the WBS,DAPam,OR SCHEDULE INPUT ROUTINES

ENTERING A ZERO "0" WILL START THE PRINTOUTS PRINTING ON THE PRINTER AND WILL TERMINATE YOUR SESSION.

SECTION IV CONSTRAINTS AND LIMITATIONS

Section IV describes the environment that TRACOM will operate under and what to do if the user encounters an error condition not explain by the computer when TRACOM is running.

The TRACOM Model was writen in HP BASIC (C),1979; it uses approximately 200K words of memory in 32K segments. The data storage requirements are approximately 5 million words.

ERROR CONDITIONS

Error checking routines have been incorporated into TRACOM; describing the problem encountered and telling the user what corrective action to take. In the event that a problem is missed by the checking routine, the HP will give a message such as "END OF FILE ENCOUNTERED IN FILE XYZ" or "WRONG TYPE OF DATA IN PROGRAM QRST"; almost all of these errors are attributable to bad data input. Check the indicated files for errors and make necessary corrections. If a SYSTEM ERROR MESSAGE such as "I/O TIMING ERROR" appears on the screen, consult the Data Processing Personnel for corrective action.

To run TRACOM in an interperative mode,rather than the compiled version, do the following;

Call up the BASIC interperator.
Run these programs in this order---EXEC3
ADDWBS9
ADDLIST0
PRINTOUT

NOTE: To obtain data entry forms after COARAW has been created, run PRINTOUT and enter the appropriate option numbers.

SECTION V SAMPLE PROBLEM

The purpose of this sample problem is to depict the various features of TRACOM. The seven files described in Section II and Appendix A are shown with sample data. In addition, input forms for WBS, DAPam, and SCHEDULE formats show what throughputs are to be made. Appendix B contains the printouts obtained from exercising TRACOM using the sample problem. Appendix C contains the WBS, DAPam and SCHEDULE inputs for the sample problem.

The sample problem assumes a scenario that includes:

An R&D phase completed in 1981
An investment phase that starts in 1982 and ends in 1984.
An O&S phase that starts in 1985 and ends in 2004.

The total program runs from 1981 to 2004. Data will be input using the WBS, DAPam, and SCHEDULE INPUT ROUTINES. Data will be calculated using CERs, LEARNING CURVES, S-CURVE/BETA DISTRIBUTION, and LEADLAG CALCULATION ROUTINES.

GLOBERAW FILE

```
GSAMPLE PROBLEM      838686887098282TXXXXXXXXXXXX

**************************************************************************

               COARAW FILE

D00000001TOTAL PROGRAM COST              0.0
D00000002R & D COST                      1.0
D00000003PROTOTYPE                       1.1
D00000004UNIT 1                          1.2
D00000005INVESTMENT                      2.0
D00000006UNIT 2                          2.1
D00000007UNIT 3                          2.2
D00000008UNIT 4                          2.3
D00000009UNIT 5                          2.4
D00000010OTHER                           2.5
D00000011OTHER                           2.5.1
D00000012MISC                            2.5.2
D00000013O & S                           3.0
D00000014PERSONNEL                       3.1
D00000015FACILITIES                      3.2
D00000016SPARES                          3.3
D99999999END OF FILE DATA                9.9.9.9.9.9.9.9
W00000001TOTAL COST                      0.0
W00000002INVESTMENT                      2.0
W00000003UNIT 2                          2.1                    D00000006
W00000004UNIT 3                          2.2                    D00000007
```

```
W00000005UNIT 4                          2.3                              D0000000083CC
W00000006UNIT 5                          2.4                              D0000000093CC
W99999999END OF FILE DATA                9.9.9.9.9.9.9.9.9                          9TT
```

****

SCHEDULE FILE

```
S00000001SCHEDULE #1 PERSONNEL           1                                          1LL
S00000002SCHEDULE #2 FACILITIES          2                                          1LL
S00000003SCHEDULE #3 SPARES              3                                          1LL
S00000004SCHEDULE #4 LEARNING QTYS       4                                          1LL
S00000005SCHEDULE #5  LEADLAG            5                                          1LL
D99999999END OF DATA                     9.9.9                                      1LL
```

NOTE: SCHEDULES 1, 2, AND 3 CONTAIN EQUIVELANT UNIT DATA AND
ARE USED IN THE CER CALCULATION ROUTINE.

SCHEDULE 5 IS USED IN THE LEADLAG ROUTINE.

****

LEADLAG FILE

```
W00000003S0000000500000033003300 34
W00000004S0000000500010033003300 34
W00000005S0000000500020033003300 34
W00000006S0000000500030010002000300040
D99999999S000000050003005000 50
```

THE FIRST RECORD TELLS THE COMPUTER TO START SPREADING COSTS IN THE FIRST YEAR SPECIFIED IN SCHEDULE S00000005 AND PUT 33%, 33%, AND 34% OF THE COSTS ASSOCIATED WITH WBS ROW W00000003 IN THE FOLLOWING THREE YEARS IN DAPAM ROW D00000006 (FROM XREF COLUMN IN COARAW).

THE SECOND RECORD TELLS THE COMPUTER TO START SPREADING COSTS IN THE FIRST YEAR SPECIFIED IN SCHEDULE S00000005 AND PUT 33%, 33%, AND 34% OF THE COSTS ASSOCIATED WITH WBS ROW W00000004 IN THE FOLLOWING THREE YEARS IN DAPAM ROW D00000007 (FROM XREF COLUMN IN COARAW) AFTER LAGING 1 YEAR.

THE THIRD RECORD TELLS THE COMPUTER TO START SPREADING COSTS IN THE FIRST YEAR SPECIFIED IN SCHEDULE S00000005 AND PUT 33%, 33%, AND 34% OF THE COSTS ASSOCIATED WITH WBS ROW W00000005 IN THE FOLLOWING THREE YEARS IN DAPAM ROW D00000008 (FROM XREF COLUMN IN COARAW) AFTER LAGING 2 YEARS.

THE FOURTH RECORD TELLS THE COMPUTER TO START SPREADING COSTS IN THE FIRST YEAR SPECIFIED IN SCHEDULE S00000005 AND PUT 10%, 20%, 30% AND 40% OF THE COSTS ASSOCIATED WITH WBS ROW W00000006 IN THE FOLLOWING FOUR YEARS IN DAPAM ROW D00000009 (FROM XREF COLUMN IN COARAW) AFTER LAGING 3 YEARS.

****

CER FILE

```
00001V0001     40                      +1234
00002V0001     40                      X10.00
00003W0000000301                       +V0001
00004V0002     40                      +4567
00005V0002     40                      X20.00
00006W0000000302                       +V0002
00007W0000000303V0002     40           X.5
00011V0003     40                      +7890
00012V0003     40                      X10.00
00013W0000000401                       +V0003
00014V0004     40                      +8888
00015V0004     40                      X20.00
00016W0000000402                       +V0004
00017W0000000403V0004     40           X.5
00001D00000014                 S00000001X25
00002D00000015                 S00000002X100
00003D00000016                 S00000003X50
```

NOTE: SEQUENCE 1 AND 2 CALCULATE
ENG$ =ENGINEERING HOURS X ENGINEERING RATE
V0001 = 1234 X $10
SEQUENCE 3 ASSIGNS V0001 TO WBS ROW W00000003 COLUMN 1

SEQUENCES 4 AND 5 CALCULATE
MFG$ = MANUFACTURING HOURS X MANUFACTURING RATE
V0002 = 4567 X $20
SEQUENCE 6 ASSIGNS V0002 TO WBS ROW W00000003 COLUMN 2

SEQUENCE 7 CALCULATES
MATL$ = MANUFACTURING COST (MFG$) X MANUFACTURING FACTOR
W00000003, COLUMN 3 = V0002 X .50

SEQUENCES 11 THROUGH 17 ACCOMPLISH THE SAME FUNCTIONS AS ABOVE, EXEPT FOR A DIFFERENT WBS ROW.

SEQUENCE 18 CALCULATES
PERSONNEL COSTS =
NUMBER OF PERSONNEL/YEAR X PERSONNEL RATE
D00000014 = S00000001 X $25

SEQUENCE 19 CALCULATES
FACILITY COST =
SQUARE FEET/YEAR X COST/SQUARE FEET

D00000015 = S00000002 X $100
D00000015 = S00000002 X $100

SEQUENCE 20 CALCULATES
SPARES COST = EQUIVELANT UNITS/YEARS X SPARES RATE
D00000016 = S00000003 X $50

****

TMFZRAW FILE

D0000001119850 32V0005
D0000001219880 23V0006

THE FIRST RECORD TELLS THE COMPUTER TO USE BETA CURVE 2 AND START SPREADING COSTS IN 1985 FOR 2 YEARS USING THE VALUE FOUND IN VARIABLE V0005, PUTTING THE RESULTS IN DAPAM ROW D00000011.

THE SECOND RECORD TELLS THE COMPUTER TO USE BETA CURVE 4 AND START SPREADING THE COSTS IN 1988 FOR 4 YEARS USING THE VALUE FOUND IN VARIABLE V0006, PUTTING THE RESULTS IN DAPAM ROW D00000012.

****

LERNCURV FILE

W00000005S00000003 10095WL
W00000006S00000003 10095CL

THE FIRST RECORD TELLS THE COMPUTER TO USE THE UNITS FOUND IN SCHEDULE ROW S0000004, APPLY A 95% SLOPE USING A WRIGHT CURVE, MULTIPLY TIMES A FIRTS UNIT COST OF $100 AND PUT THE RESULTS IN WBS ROW NUMBER W00000005.

THE SECOND RECORD TELLS THE COMPUTER TO USE THE UNITS FOUND IN SCHEDULE ROW S00000004, APPLY A 95% SLOPE USING A CRAWFORD CURVE, MULTIPLY TIMES A FIRST UNIT COST OF $100 AND PUT THE RESULTS IN WBS ROW W00000006.

APPENDIX A

PROCEDURUAL INSTRUCTIONS

GLOBERAW FILE

Data Entry Format

PURPOSE:

The GLOBAL file contains the information necessary to instruct the computer as to which headings and APPROPRIATION FUND CODES to print.

Col.		Description
1	=	G
2-21	=	Program Name
22-23	=	First Year of R&D Phase
24-25	=	Last Year of R&D Phase
26-27	=	First Year of Investment Phase
28-29	=	Last Year of Investment Phase
30-31	=	First Year of O&S Phase
32-33	=	Last Year of O&S Phase
34-35	=	Escalation Base Year (year dollars are to escalated)
36-37	=	Constant Dollar Year (year dollars are in)
38	=	T or M (thousands or millions)

NOTE: ENTER AN 'X' FOR EACH APPROPRIATION TYPE USED IN THIS BCE.

39	=	Blank or X for RDTE Funds
40	=	Blank or X for MCA Funds
41	=	Blank or X for MPA Funds
42	=	Blank or X for OMA Funds
43	=	Blank or X for OPA Funds
44	=	Blank or X for AMA Funds
45	=	Blank or X for APA Funds
46	=	Blank or X for MIPA Funds
47	=	Blank or X for WVA Funds
48	=	Blank or X for RDIH Funds
49	=	Blank or X for OMAS Funds
50	=	Blank or X for PEMA Funds

KEYPUNCH INSTRUCTIONS

1. Log on in appropriate account and group.
2. Call up Editor subsystem.
3. Set record length to 80. If the user uses tab stops, be sure to have the terminal set for "TAB=SPACES".
4. If needed, call up text file.
5. Add records in "Quiet" mode (line numbers will not be displayed, but all data for one record will fit on one screen line).
6. Keep file unnumbered under file name GLOBERAW.

NOTE: SEE THE HP 3000 'EDIT 3000' MANUAL FOR A FURTHER EXPLANATION OF THE INSTRUCTIONS PRESENTED HERE.

COARAW FILE

Data Entry Format

PURPOSE:

The Chart of Accounts file contains the information required to instruct the computer to prompt the user to input WBS and DAPam costs. Additionally, it tells the computer which WBS item costs are to be transferred to the DAPam files and what appropriation fund escalation factors are to be applied to each DAPam item.

Col.		Description
		Row Number:
1	=	*D for DAPam or W for WBS Element*
2-9	=	Unique Identification Number
10-39	=	Element Name
40-65	=	DAPam or WBS Number
66-74	=	FOR DA PAM: Must be blank FOR WBS: The DA PAM number to which this element will be applied
75	=	Level Number
76	=	C for Contract, H for In-House, T for Combination
77	=	FOR DA PAM: Appropriation Fund Code or T if this element is a totaled value FOR WBS: T if this is a summed value; L if amounts will be loaded

KEYPUNCH INSTRUCTIONS

1. Log on in appropriate account and group.
2. Call up Editor subsystem.
3. Set record length to 80. If the user uses tab stops, be sure to have the terminal set for "TAB=SPACES".
4. If needed, call up text file.
5. Add records in "Quiet" mode (line numbers will not be displayed, but all data for one record will fit on one screen line).
6. Keep file unnumbered under file name COARAW.

APPROPRIATION FUND CODES

DESCRIPTION	INPUT DESIGNATION	REPORT DESIGNATION
Aircraft Procurement	A	APA
Ammunition Procurement	B	AMA
Military Construction	C	MCA
Production	E	PEMA
Missile Procurement	G	MIPA
RTDE In-House	H	RDIH
Operations and Maintenance	M	OMA
Military Personnel	P	MPA
Research, Development, Test & Eval.	R	RDTE
Operations & Maint., Salary	S	OMAS
Totaled Element - No Fund Type	T	
Weapons & Tracked Vehicle	W	WTCV
Other Procurement	X	OPA

LEADLAG FILE

Data Entry Format

PURPOSE:

The LEADLAG file instructs the computer as to how the costs for the WBS elements are to be spread to the appropriate DAPam elements. Specifically, the analyst has a choice of spreading the WBS cost by a particular schedule plus or minus a maximum of six years

COL.		DESCRIPTION
1-9	=	WBS ROW NUMBER - First character must be "W"
10-17	=	Schedule Row Number - First character must be "S"
18-19	=	Number of Lead Years
20-21	=	Number of Lag Years
22-26	=	1st % - At most 5 characters, including the decimal
27-31	=	2nd % - At most 5 characters, including the decimal
32-36	=	3rd % - At most 5 characters, including the decimal
37-41	=	4th % - At most 5 characters, including the decimal
42-46	=	5th % - At most 5 characters, including the decimal
47-51	=	6th % - At most 5 characters, including the decimal

KEYPUNCH INSTRUCTIONS

1. Log on in appropriate account and group.
2. Call up Editor subsystem.
3. Set record length to 80. If the user uses tab stops, be sure to have the terminal set for "TAB=SPACES".
4. If needed, call up text file.
5. Add records in "Quiet" mode (line numbers will not be displayed, but all data for one record will fit on one screen line).
6. Keep file unnumbered under file name LEADLAG.

SCHEDULE FILE

Data Entry Format

PURPOSE:

The Schedule file contains the information required to instruct the computer to prompt the user to input SCHEDULE data.

COL.		DESCRIPTION
1-9	=	Schedule Row Number - First character must be "S"
10-39	=	Schedule Element Name
40-65	=	Schedule Number
66-74	=	Blank
75-77	=	1QQ

KEYPUNCH INSTRUCTIONS

1. Log on in appropriate account and group.
2. Call up Editor subsystem.
3. Set record length to 80. If the user uses tab stops, be sure to have the terminal set for "TAB=SPACES".
4. If needed, call up text file.
5. Add records in "Quiet" mode (line numbers will not be displayed, but all data for one record will fit on one screen line).
6. Keep file unnumbered under file name SCHEDULE.

LERNCURV FILE

Data Entry Format

PURPOSE:

The LEARNING CURVE File is used to instruct the computer where to apply and which learning curve functions to apply to which WBS elements.

COL.		DESCRIPTION
1-9	=	Output Row Number - First character must be "W"
10-18	=	Input Row Number
19-26	=	First Unit Cost
27-28	=	Slope
29-30	=	Curve Type "CL" for Crawford (UNIT) or "WL" for Wright (CUM).

KEYPUNCH INSTRUCTIONS

1. Log on in appropriate account and group.
2. Call up Editor subsystem.
3. Set record length to 80. If the user uses tab stops, be sure to have the terminal set for "TAB=SPACES".
4. If needed, call up text file.
5. Add records in "Quiet" mode (line numbers will not be displayed, but all data for one record will fit on one screen line).
6. Keep file unnumbered under file name LERNCURV.

TMFZRAW FILE

Data Entry Format

PURPOSE:

The S-Curve file is used to supply information to the computer to allow it to spread costs by calendar or fiscal year periods using a "BETA" distribution.

COL.		DESCRIPTION
1-9	=	Output Row Number - First character must be "D"
10-13	=	Year Spreading is to Begin
14-15	=	Number of Years to Spread
16	=	BETA Curve Number
		NOTE: 1=80% 2=60% 3=50% 4=40% 5=20% OF COST SPENT BY 50% OF TIME.
17-25	=	Dollar Amount to be Spread

KEYPUNCH INSTRUCTIONS

1. Log on in appropriate account and group.
2. Call up Editor subsystem.
3. Set record length to 80. If the user uses tab stops, be sure to have the terminal set for "TAB=SPACES".
4. If needed, call up text file.
5. Add records in "Quiet" mode (line numbers will not be displayed, but all data for one record will fit on one screen line).
6. Keep file unnumbered under file name TMFZRAW.

CER FILE

Data Entry Format

PURPOSE:

The CER file is used to supply information to the computer to allow it to calculate costs either for a single element within a WBS/DAPam row or for and entire DAPam row.

COL.		DESCRIPTION
1-5	=	Sequence Number
6-14	=	Output Row Number
15-16	=	Output Column Number
17-25	=	Input Row Number
26-27	=	Input Column Number
28-36	=	Schedule Row Number
37	=	Process Indicator
38-46	=	Variable

KEYPUNCH INSTRUCTIONS

1. Log on in appropriate account and group.
2. Call up Editor subsystem.
3. Set record length to 80. If the user uses tab stops, be sure to have the terminal set for "TAB=SPACES".
4. If needed, call up text file.
5. Add records in "Quiet" mode (line numbers will not be displayed, but all data for one record will fit on one screen line).
6. Keep file unnumbered under file name CER.

APPENDIX B

OUTPUT FROM SAMPLE PROBLEM

SAMPLE PROBLEM D-1
TIME-PHASED COST BY DA PAM FORMAT
CONSTANT FY81 DOLLARS IN THOUSANDS

CODE NO	COST ELEMENT	TOTAL	82	83	84
1.0	R & D COST	2142	270	714	1158
1.1	PROTOTYPE	1368	123	456	789
1.2	UNIT 1	774	147	258	369

SAMPLE PROBLEM D-1
TIME-PHASED COST BY DA PAM FORMAT
ESCALATED DOLLARS IN THOUSANDS

CODE NO	COST ELEMENT	TOTAL	82	83	84
1.0	R & D COST	2398	279	785	1334
1.1	PROTOTYPE	1537	127	501	909
1.2	UNIT 1	861	152	284	425

SAMPLE PROBLEM D-1
TIME-PHASED COST BY DA PAM FORMAT
CONSTANT FY81 DOLLARS IN THOUSANDS

CODE NO	COST ELEMENT	TOTAL	85	86	87	88
2.0	INVESTMENT	518423	49886	163714	168223	122093
2.1	UNIT 2	149351	49286	49286	50779	0
2.2	UNIT 3	345540	0	114028	114028	117484
2.3	UNIT 4	10352	0	0	3416	3416
2.4	UNIT 5	11180	0	0	0	1118
2.5	OTHER	2000	600	400	0	75
2.5.1	OTHER	1000	600	400	0	0
2.5.2	MISC	1000	0	0	0	75

SAMPLE PROBLEM D-1
TIME-PHASED COST BY DA PAM FORMAT
CONSTANT FY81 DOLLARS IN THOUSANDS

CODE NO	COST ELEMENT	89	90	91
2.0	INVESTMENT	6081	3766	4660
2.1	UNIT 2	0	0	0
2.2	UNIT 3	0	0	0
2.3	UNIT 4	3520	0	0
2.4	UNIT 5	2236	3354	4472
2.5	OTHER	325	412	188
2.5.1	OTHER	0	0	0
2.5.2	MISC	325	412	188

SAMPLE PROBLEM D-1
TIME-PHASED COST BY DA PAM FORMAT
ESCALATED DOLLARS IN THOUSANDS

CODE NO	COST ELEMENT	TOTAL	85	86	87	88
	INVESTMENT	668238	59325	203480	218387	165632
2.0	UNIT 2	185790	58611	61258	65921	0
2.1	UNIT 3	449135	0	141725	148031	159379
2.2	UNIT 4	14059	0	0	4435	4634
2.3	UNIT 5	16579	0	0	0	1517
2.4	OTHER	2675	714	497	0	102
2.5	OTHER	1211	714	497	0	0
2.5.1	MISC	1464	0	0	0	102
2.5.2						

SAMPLE PROBLEM D-1
TIME-PHASED COST BY DA PAM FORMAT
ESCALATED DOLLARS IN THOUSANDS

CODE NO	COST ELEMENT	89	90	91
2.0	INVESTMENT	8621	5579	7214
2.1	UNIT 2	0	0	0
2.2	UNIT 3	0	0	0
2.3	UNIT 4	4990	0	0
2.4	UNIT 5	3170	4969	6923
2.5	OTHER	461	610	291
2.5.1	OTHER	0	0	0
2.5.2	MISC	461	610	291

SAMPLE PROBLEM D-1
TIME-PHASED COST BY DA PAM FORMAT
CONSTANT FY81 DOLLARS IN THOUSANDS

CODE NO	COST ELEMENT	TOTAL	85	86	87	88
3.0	O & S	2250	25	25	25	125
3.1	PERSONNEL	500	25	25	25	25
3.2	FACILITIES	1000	0	0	0	100
3.3	SPARES	750	0	0	0	0

SAMPLE PROBLEM D-1
TIME-PHASED COST BY DA PAM FORMAT
CONSTANT FY81 DOLLARS IN THOUSANDS

CODE NO	COST ELEMENT	89	90	91	92	93
3.0	O & S	125	175	175	175	175
3.1	PERSONNEL	25	25	25	25	25
3.2	FACILITIES	100	100	100	100	100
3.3	SPARES	0	50	50	50	50

SAMPLE PROBLEM D-1
TIME-PHASED COST BY DA PAM FORMAT
CONSTANT FY81 DOLLARS IN THOUSANDS

CODE NO	COST ELEMENT	94	95	96	97	98
3.0	O & S	175	175	175	175	75
3.1	PERSONNEL	25	25	25	25	25
3.2	FACILITIES	100	100	100	100	0
3.3	SPARES	50	50	50	50	50

SAMPLE PROBLEM D-1
TIME-PHASED COST BY DA PAM FORMAT
CONSTANT FY81 DOLLARS IN THOUSANDS

CODE NO	COST ELEMENT	99	0	1	2	3
3.0	O & S	75	75	75	75	75
3.1	PERSONNEL	25	25	25	25	25
3.2	FACILITIES	0	0	0	0	0
3.3	SPARES	50	50	50	50	50

SAMPLE PROBLEM D-1
TIME-PHASED COST BY DA PAM FORMAT
CONSTANT FY81 DOLLARS IN THOUSANDS

CODE NO	COST ELEMENT	4
3.0	O & S	75
3.1	PERSONNEL	25
3.2	FACILITIES	0
3.3	SPARES	50

SAMPLE PROBLEM D-1
TIME-PHASED COST BY DA PAM FORMAT
ESCALATED DOLLARS IN THOUSANDS

CODE NO	COST ELEMENT	TOTAL	85	86	87	88
3.0	O & S	4139	30	31	32	170
3.1	PERSONNEL	932	30	31	32	34
3.2	FACILITIES	1669	0	0	0	136
3.3	SPARES	1538	0	0	0	0

SAMPLE PROBLEM D-1
TIME-PHASED COST BY DA PAM FORMAT
ESCALATED DOLLARS IN THOUSANDS

CODE NO	COST ELEMENT	89	90	91	92	93
3.0	O & S	177	259	271	283	296
3.1	PERSONNEL	35	37	39	40	42
3.2	FACILITIES	142	148	155	162	169
3.3	SPARES	0	74	77	81	85

SAMPLE PROBLEM D-1
TIME-PHASED COST BY DA PAM FORMAT
ESCALATED DOLLARS IN THOUSANDS

CODE NO	COST ELEMENT	94	95	96	97	98
3.0	O & S	309	323	337	353	158
3.1	PERSONNEL	44	46	48	50	53
3.2	FACILITIES	177	185	193	202	0
3.3	SPARES	88	92	96	101	105

SAMPLE PROBLEM D-1
TIME-PHASED COST BY DA PAM FORMAT
ESCALATED DOLLARS IN THOUSANDS

CODE NO	COST ELEMENT	99	0	1	2	3
3.0	O & S	165	173	180	189	197
3.1	PERSONNEL	55	58	60	63	66
3.2	FACILITIES	0	0	0	0	0
3.3	SPARES	110	115	120	126	131

SAMPLE PROBLEM D-1
TIME-PHASED COST BY DA PAM FORMAT
ESCALATED DOLLARS IN THOUSANDS

CODE NO	COST ELEMENT	4
3.0	O & S	206
3.1	PERSONNEL	69
3.2	FACILITIES	0
3.3	SPARES	137

SAMPLE PROBLEM D-1
WBS COSTS
CONSTANT FY81 DOLLARS IN THOUSANDS

WBS NO.	ELEMENT NAME	TOTAL	ENG$	MFG$	MATL$
0.0	TOTAL COST	516423	99025	276107	141291
2.0	INVESTMENT	516423	99025	276107	141291
2.1	UNIT 2	149350	12340	91340	45670
2.2	UNIT 3	345540	78900	177760	88880
2.3	UNIT 4	10353	3743	3369	3241
2.4	UNIT 5	11180	4042	3638	3500

SAMPLE PROBLEM D-1
TIME-PHASED COSTS BY APPROPRIATION FUND
CONSTANT FY81 DOLLARS IN THOUSANDS

PHASE	APPRO FUND	PRIOR YEARS	81	82	83	84	85	OUT YEARS	TOTAL
TOTAL PROGRAM COST		0	0	270	714	1158	49911	470762	522815
R & D COST		0	0	270	714	1158	0	0	2142
	RDTE	0	0	270	714	1158	0	0	2142
INVESTMENT		0	0	0	0	0	49886	468537	518423
	OMA	0	0	0	0	0	49886	468537	518423
O & S		0	0	0	0	0	25	2225	2250
	OMA	0	0	0	0	0	25	2225	2250

APPENDIX C

DATA INPUT FORMS

SAMPLE PROBLEM D-1
TIME-PHASED COSTS BY APPROPRIATION FUND
ESCALATED DOLLARS IN THOUSANDS

PHASE	APPRO FUND	PRIOR YEARS	81	82	83	84	85	OUT YEARS	TOTAL
TOTAL PROGRAM COST		0	0	279	785	1334	59355	613022	674775
R & D COST		0	0	279	785	1334	0	0	2398
	RDTE	0	0	279	785	1334	0	0	2398
INVESTMENT		0	0	0	0	0	59325	608913	668238
	OMA	0	0	0	0	0	59325	608913	668238
O & S		0	0	0	0	0	30	4109	4139
	OMA	0	0	0	0	0	30	4109	4139

DAPENTRY PAGE 1 DATE:

SAMPLE PROBLEM D-1
Da Pam Time Phased
Data Entry Form

YEAR 0:	0	1	2	3	4	5	6	7	8	9
*** TOTAL *** ROW NUMBER: D00000001 ELEMENT NAME: TOTAL PROGRAM COST DAPAM NUMBER:0.0										
*** TOTAL *** ROW NUMBER: D00000002 ELEMENT NAME: R & D COST DAPAM NUMBER:1.0										
ROW NUMBER: D00000003 ELEMENT NAME: PROTOTYPE DAPAM NUMBER:1.1										
YEAR + 1980			123	456	789					
YEAR + 1990										
YEAR + 2000										
YEAR + 2010										
ROW NUMBER: D00000004 ELEMENT NAME: UNIT 1 DAPAM NUMBER:1.2										
YEAR + 1980			147	258	369					
YEAR + 1990										
YEAR + 2000										
YEAR + 2010										
*** TOTAL *** ROW NUMBER: D00000005 ELEMENT NAME: INVESTMENT DAPAM NUMBER:2.0										
ROW NUMBER: D00000006 ELEMENT NAME: UNIT 2 DAPAM NUMBER:2.1										
YEAR + 1980			0							
YEAR + 1990										
YEAR + 2000										
YEAR + 2010										
ROW NUMBER: D00000007 ELEMENT NAME: UNIT 3 DAPAM NUMBER:2.2										
YEAR + 1980			0							
YEAR + 1990										
YEAR + 2000										
YEAR + 2010										
ROW NUMBER: D00000008 ELEMENT NAME: UNIT 4 DAPAM NUMBER:2.3										
YEAR + 1980			0							
YEAR + 1990										
YEAR + 2000										
YEAR + 2010										

DAPENTRY PAGE 2 DATE:

SAMPLE PROBLEM D-1
Da Pam Time Phased
Data Entry Form

YEAR 0: 0 1 2 3 4 5 6 7 8 9

ROW NUMBER: D00000009 ELEMENT NAME: UNIT S DAPAM NUMBER:2.4

YEAR + 1980
YEAR + 1990
YEAR + 2000
YEAR + 2010

*** TOTAL *** ROW NUMBER: D00000010 ELEMENT NAME: OTHER DAPAM NUMBER:2.5

ROW NUMBER: D00000011 ELEMENT NAME: OTHER DAPAM NUMBER:2.5.1

YEAR + 1980
YEAR + 1990
YEAR + 2000
YEAR + 2010

ROW NUMBER: D00000012 ELEMENT NAME: MISC DAPAM NUMBER:2.5.2

YEAR + 1980
YEAR + 1990
YEAR + 2000
YEAR + 2010

*** TOTAL *** ROW NUMBER: D00000013 ELEMENT NAME: O & S DAPAM NUMBER 3.0

ROW NUMBER: D00000014 ELEMENT NAME: PERSONNEL DAPAM NUMBER:3.1

YEAR + 1980
YEAR + 1990
YEAR + 2000
YEAR + 2010

ROW NUMBER: D00000015 ELEMENT NAME: FACILITIES DAPAM NUMBER.3.2

YEAR + 1980
YEAR + 1990
YEAR + 2000
YEAR + 2010

ROW NUMBER: D00000016 ELEMENT NAME: SPARE: DAPAM NUMBER.3.3

YEAR + 1980
YEAR + 1990
YEAR + 2000
YEAR + 2010

SCDENTRY PAGE 1 DATE:

SAMPLE PROBLEM D-1
Schedule Inputs
Data Entry Form

YEAR #:	0	1	2	3	4	5	6	7	8	9

ROW NUMBER: S00000001 SCHEDULE NAME: SCHEDULE #1 PERSONNEL SCHEDULE NUMBER: 1

YEAR + 1980										
YEAR + 1990										
YEAR + 2000										
YEAR + 2010										

ROW NUMBER: S00000002 SCHEDULE NAME: SCHEDULE #2 FACILITIES SCHEDULE NUMBER: 2

YEAR + 1980										
YEAR + 1990										
YEAR + 2000										
YEAR + 2010										

ROW NUMBER: S00000003 SCHEDULE NAME: SCHEDULE #3 SPARES SCHEDULE NUMBER: 3

YEAR + 1980										
YEAR + 1990										
YEAR + 2000										
YEAR + 2010										

ROW NUMBER: S00000004 SCHEDULE NAME: SCHEDULE #4 LEARNING QTYS SCHEDULE NUMBER: 4

YEAR + 1980										
YEAR + 1990										
YEAR + 2000										
YEAR + 2010										

ROW NUMBER: S00000005 SCHEDULE NAME: SCHEDULE #5 LEADLAG SCHEDULE NUMBER: 5

YEAR + 1980										
YEAR + 1990										
YEAR + 2000										
YEAR + 2010										

WBSENTRY PAGE 1 DATE:

SAMPLE PROBLEM D-1
WBS FUNCTIONAL ELEMENT
DATA ENTRY FORM

COLUMN #:	1	2	3	4	5	6	7	8	9	10
COLUMN NAME:	ENG$	MFG$	MATL$							

*** TOTAL *** ROW NUMBER: W00000001 ELEMENT NAME: TOTAL COST WBS NUMBER: 0.0

*** TOTAL *** ROW NUMBER: W00000002 ELEMENT NAME: INVESTMENT WBS NUMBER: 2.0

ROW NUMBER: W00000003 ELEMENT NAME: UNIT 2 WBS NUMBER: 2.1

	0	0	0							

ROW NUMBER: W00000004 ELEMENT NAME: UNIT 3 WBS NUMBER: 2.2

	0	0	0							

ROW NUMBER: W00000005 ELEMENT NAME: UNIT 4 WBS NUMBER: 2.3

	0	0	0							

ROW NUMBER: W00000006 ELEMENT NAME: UNIT 5 WBS NUMBER: 2.4

	0	0	0							

*** TOTAL *** ROW NUMBER: W99999999 ELEMENT NAME: END OF FILE DATA WBS NUMBER: 9.9.9 9.9 9.9 9.9

APPENDIX D

DATA FLOW CHART

GIVEN:

BCE ELEMENTS (WBS/DAPAM)
CDS/YES
SCHEDULE (QUANTITIES vs. TIME)

WHAT THE USER HAS TO DO TO RUN TRACOM:

1) PUT PROGRAM NAME, etc. IN GLOBERAW (See page 34)
2) PUT WBS/DAPAM ELEMENTS IN COARAW (See page 35)
3) PUT SCHEDULE ELEMENTS IN SCHEDULE (See page 38)
4) PUT CDS/YES* IN CER (See page 41)
LEADLAG (See page 37)
TMF2RAW (See page 40)
LERNCURV (See page 39)

5) SET UP WBS FILE STRUCTURE AND ENTER THROUGHPUTS
USING OPTION 1 (See page 13)
6) SET UP DAPAM FILE STRUCTURE AND ENTER THROUGHPUTS
USING OPTION 2 (See page 14)
7) SET UP SCHEDULE FILE STRUCTURE AND ENTER THROUGHPUTS
USING OPTION 3 (See page 16)
8) ENTER ESCALATION FACTORS USING OPTION 4 (See page 17)
9) ADD UP RESULTS AND EXERCISE CERS, LEADLAGS, LEARNING
CURVES AND S-CURVES (See page 19)
10) GET PRINTOUTS (See page 24)

NOTE: *
USE THE APPROPRIATE FILE TO OBTAIN THE COSTS FROM THE CDS/YES. SEE THE REFERENCED PAGES TO DETERMINE WHICH OF THE FILES/ROUTINES WILL BEST SUIT THE PURPOSE OF THE BCE.

APPENDIX D
TRACOM DATA FLOW CHART